

AMENDMENT AND PRESENTATION OF CLAIMS

Please replace all prior claims in the present application with the following claims, in which claims 6, 20-30, 35, 36, 47-52, 60, 73, 82, 83, 87-97, 102 and 103 are canceled without prejudice or disclaimer, and claims 7, 9, 10, 12, 74, 76, 77, 78, 84 and 86 are currently amended.

1. (Previously Presented) An optical switch facilitating the verification of optical path integrity, comprising a plurality of optical signal ports and at least one optical switching element for causing an optical signal incident along a first optical signal port to be transmissively coupled to a second optical signal port, the optical switch further comprising:

a supplemental signal detector coupled to the second optical signal port for detecting a supplemental signal associated with the optical signal, wherein the supplemental signal includes a modulation applied to the optical signal,

wherein the optical switch receives information about at least one attribute of the detected supplemental signal from the supplemental signal detector and issues a fault indication if the attribute does not meet an expected criterion, and

wherein the criterion is determined based upon at least one previously detected value of the attribute.

2. (Canceled)

3. (Previously Presented) The optical switch of claim 1 wherein the criterion is affected by information from a source outside of the optical switch.

4. (Canceled)

5. (Previously Presented) The optical switch of claim 1 wherein the attribute is an amplitude level related to the supplemental signal.

6. (Canceled)

7. (Currently Amended) The optical switch of claim 6 ~~9~~ wherein the first supplemental signal detector determines information about at least one attribute of the detected supplemental signal and the optical switch further issues a the fault indication if the attribute does not meet an expected criterion.

8. (Original) The optical switch of claim 7 wherein the expected criterion is affected by information from a source outside of the optical switch.

9. (Currently Amended) An optical switch facilitating the verification of optical path integrity, comprising a plurality of optical signal ports and at least one optical switching element for causing an optical signal incident along a first optical signal port to be transmissively coupled to a second optical signal port, the optical switch further comprising:

a first supplemental signal detector coupled to the first optical signal port for detecting a supplemental signal associated with the optical signal, wherein the supplemental signal includes a modulation applied to the optical signal; and
a second supplemental signal detector coupled to the second signal port for detecting the supplemental signal associated with the optical signal,

~~The optical switch of claim 6~~ wherein the optical switch receives information about at least one attribute of the detected supplemental signals from both first and second

supplemental signal detectors and issues a fault indication based at least upon whether the information about the attribute detected in the first supplemental signal agrees with the information about the attribute detected in the second supplemental signal.

10. (Currently Amended) The optical switch of claim 6 ~~9~~ wherein the optical switch receives information about at least one attribute of the detected supplemental signals from both first and second supplemental signal detectors and further issues ~~a~~ the fault indication if either the attribute for the first supplemental signal does not meet a first expected criterion or, inclusively, the attribute for the second supplemental signal does not meet a second expected criterion.

11. (Original) The optical switch of claim 10 wherein the optical switch obtains information from a remote source affecting at least one of the first and second expected criteria.

12. (Currently Amended) An optical switch facilitating the verification of optical path integrity, comprising a plurality of optical signal ports and at least one optical switching element for causing an optical signal incident along a first optical signal port to be transmissively coupled to a second optical signal port, the optical switch further comprising:

a first supplemental signal detector coupled to the first optical signal port for detecting a supplemental signal associated with the optical signal, wherein the supplemental signal includes a modulation applied to the optical signal; and
a second supplemental signal detector coupled to the second signal port for detecting the supplemental signal associated with the optical signal,

~~The optical switch of claim 6~~ wherein the first supplemental detector determines a first amplitude value of the supplemental signal and the second supplemental detector determines a second amplitude value of the supplemental signal and a loss value is calculated by subtracting the first amplitude value from the second amplitude value.

13. (Original) The optical switch of claim 12 wherein the optical switch issues a fault indication when the loss value exceeds a criterion.

14. (Original) The optical switch of claim 13 wherein the criterion is based upon previous values of the loss value.

15. (Original) The optical switch of claim 13 wherein the criterion is affected by information from a source outside of the optical switch.

16. (Previously Presented) The optical switch of claim 1 further comprising:

a supplemental signal injector coupled to the first optical signal port for adding a supplemental signal associated with the optical signal, wherein the supplemental signal includes a modulation applied to the optical signal.

17. (Canceled)

18. (Previously Presented) The optical switch of claim 16 wherein the supplemental signal detector determines information about at least one attribute of the detected supplemental signal and the optical switch issues a fault indication based upon whether the attribute meets an expected criterion.

19. (Previously Presented) The optical switch of claim 16 wherein the optical switch determines the value of at least one attribute of the supplemental signal injected by the supplemental signal injector and receives information about the value of the attribute detected in the supplemental signal from the supplemental signal detector and issues a fault indication based upon whether the value of the attribute detected by the supplemental signal detector agrees with the value of the attribute imparted by the supplemental signal injector.

20 – 30. (Canceled)

31. (Previously Presented) An optical switch facilitating the verification of optical path integrity, comprising a plurality of optical signal ports and an optical switching matrix for causing an optical signal incident along a first optical signal port to be transmissively coupled to a second optical signal port, wherein the optical signal has an associated first supplemental signal originating outside of the optical switch, the optical switch further comprising:

a supplemental signal modifier coupled to the first optical signal port which may change the first supplemental signal into a second supplemental signal associated with the optical signal; and

a supplemental signal detector coupled to the second signal port for detecting at least one supplemental signal associated with the optical signal,

wherein the optical switch infers at least one attribute of the first supplemental signal by detection of the second supplemental signal and issues a fault indication depending at least upon whether the attribute meets an expected criterion for the first supplemental signal.

32. (Original) The optical switch of claim 31 wherein the criterion is affected by information from a source outside of the optical switch.

33. (Previously Presented) An optical switch facilitating the verification of optical path integrity, comprising a plurality of optical signal ports and an optical switching matrix for causing an optical signal incident along a first optical signal port to be transmissively coupled to a second optical signal port, wherein the optical signal has an associated first supplemental signal originating outside of the optical switch, the optical switch further comprising:

a supplemental signal modifier coupled to the first optical signal port which may change the first supplemental signal into a second supplemental signal associated with the optical signal; and

a supplemental signal detector coupled to the second signal port for detecting at least one supplemental signal associated with the optical signal,

wherein the optical switch infers at least one attribute of the first supplemental signal by detecting the second supplemental signal and issues a fault indication depending at least upon whether the first supplemental signal does not meet a first expected criterion or, inclusively, the second supplemental signal does not meet a second expected criterion.

34. (Original) The optical switch of claim 33 wherein at least one of the first and second criteria are affected by information from a source outside of the optical switch.

35. (Canceled)

36. (Canceled)

37. (Previously Presented) An optical switch facilitating the verification of optical path integrity, comprising a plurality of optical signal ports and an optical switching matrix for causing an optical signal incident along a first optical signal port to be transmissively coupled to a second optical signal port, wherein the optical signal has an associated first supplemental signal originating outside of the optical switch, the optical switch further comprising:

a supplemental signal modifier coupled to the first optical signal port which may change the first supplemental signal into a second supplemental signal associated with the optical signal; and

a supplemental signal detector coupled to the second signal port for detecting at least one supplemental signal associated with the optical signal,

wherein at least one attribute of the first supplemental signal is detected by the supplemental signal modifier and the attribute of the first supplemental signal is also inferred from the second supplemental signal received by the supplemental signal detector and the optical switch issues a fault indication depending at least upon whether the value of the attribute detected by the supplemental signal modifier differs from the value of the attribute detected by the supplemental signal detector.

38-46. (Canceled)

47-52. (Canceled)

53. (Original) In an optical network comprising at least one optical switch, a method for verifying optical path integrity comprising the steps of:

providing in the network at least one optical signal having at least one first supplemental signal associated therewith;

directing the network to route the optical signal to a first port of the optical switch;

as the optical signal approaches the first port, associating a second supplemental signal with the optical signal;

directing the optical switch to couple the first port to a second port of the optical switch;

at the second port, detecting the second supplemental signal;

indirectly determining at least one attribute of the first supplemental signal based upon the detected second supplemental signal; and

determining whether the routing of the optical signal is correct based upon the indirectly determined attribute.

54. (Original) The method of claim 53 wherein the first supplemental signal does not reach the second port.

55. (Original) The method of claim 54 wherein the second supplemental signal replaces the first supplemental signal.

56. (Original) The method of claim 53 wherein the second supplemental signal bears a known relationship to the first supplemental signal.

57. (Previously Presented) The method of claim 56 wherein the second supplemental signal is created from the first supplemental signal by a known operation.

58. (Previously Presented) The method of claim 57 wherein the second supplemental signal is formed by modifying the first supplemental signal.

59. (Original) The method of claim 58 wherein the second supplemental signal is formed by addition to the first supplemental signal and the first supplemental signal is substantially intact within the second supplemental signal.

60. (Canceled)

61. (Previously Presented) In an optical network comprising at least one optical switch, a method for determining optical path integrity, comprising the steps of:

providing, to a first port of the optical switch, at least one optical signal having associated therewith at least one supplemental signal having at least one attribute, wherein the one supplemental signal includes a modulation applied to the one optical signal;

establishing a first value for the attribute applicable to the optical signal upon entry to the first port, wherein the first value is established by detecting the supplemental signal and determining the first value by measurement;

directing the optical switch to couple the first port to a second port of the optical switch;

at the second port, detecting the supplemental signal and determining a second value for the attribute;

at a first instant in time, computing a first difference value between the first value and second value; and

determining optical path integrity based upon the first difference value.

62. (Previously Presented) The method of claim 61 wherein the attribute is related to amplitude.

63. (Previously Presented) The method of claim 61 wherein the attribute is related to wavelength.

64. (Previously Presented) The method of claim 61 wherein the attribute is related to frequency of the supplemental signal.

65-66. (Canceled)

67. (Original) The method of claim 61 further comprising:

at a second instant in time distinct from the first instant in time, determining a second difference value in the same manner as the determining of the first difference value; and determining optical path integrity based at least upon comparison among the first and second difference values.

68. (Previously Presented) An optical switch facilitating the verification of optical path integrity, comprising a plurality of optical signal ports and at least one optical switching means for causing an optical signal incident along a first optical signal port to be transmissively coupled to a second optical signal port, the optical switch further comprising:

at least one supplemental signal detecting means coupled to the second optical signal port for detecting at least one supplemental signal associated with the optical signal and

determining a value of at least one attribute of the supplemental signal, wherein the one supplemental signal includes a modulation applied to the optical signal;
attribute evaluating means for determining whether the value of the attribute meets at least one criterion; and
fault indicating means for issuing a fault indication based upon whether the value of the attribute meets the criterion, wherein the criterion is determined based upon at least one previously detected value of the attribute.

69. (Canceled)

70. (Previously Presented) The optical switch of claim 68 further comprising communicating means for communicating with a source outside the optical switch to affect the criterion.

71. (Canceled)

72. (Previously Presented) The optical switch of claim 68 wherein the attribute is an amplitude level related to the supplemental signal.

73. (Canceled)

74. (Currently Amended) The optical switch of claim ~~73~~ 76 further comprising:
means for determining the value of at least one attribute of the detected supplemental signal from the first supplemental signal detecting means; ~~and~~ ,

wherein the fault indicating means for issuing a is further enabled to issue the fault indication
based at least upon whether the value of the attribute does not meet at least one criterion.

75. (Original) The optical switch of claim 74 further comprising communicating means for communicating with a source outside the optical switch to affect the criterion.

76. (Currently Amended) An optical switch facilitating the verification of optical path integrity, comprising a plurality of optical signal ports and at least one optical switching means for causing an optical signal incident along a first optical signal port to be transmissively coupled to a second optical signal port, the optical switch further comprising:

a first supplemental signal detecting means coupled to the first optical signal port for detecting a supplemental signal associated with the optical signal, wherein the supplemental signal includes a modulation applied to the optical signal;

a second supplemental signal detecting means coupled to the second signal port for detecting the supplemental signal associated with the optical signal;

~~The optical switch of claim 73 further comprising: -~~

comparing means for comparing a first sampling of the supplemental signal as detected by the first supplemental signal detecting means to a second sampling of the supplemental signal as detected by the second supplemental signal detecting means; and
fault indicating means coupled to the comparing means for issuing a fault indication based at least upon whether the first sampling is substantially consistent with the second sampling.

77. (Currently Amended) An optical switch facilitating the verification of optical path integrity, comprising a plurality of optical signal ports and at least one optical switching means

for causing an optical signal incident along a first optical signal port to be transmissively coupled to a second optical signal port, the optical switch further comprising:

a first supplemental signal detecting means coupled to the first optical signal port for detecting a supplemental signal associated with the optical signal, wherein the supplemental signal includes a modulation applied to the optical signal;

a second supplemental signal detecting means coupled to the second signal port for detecting the supplemental signal associated with the optical signal;

~~The optical switch of claim 73 further comprising:~~

comparing means for comparing a first value of at least one attribute of the supplemental signal as detected by the first supplemental signal detecting means to a second value of the attribute of the supplemental signal as detected by the second supplemental signal detecting means; and

fault indicating means coupled to the comparing means for issuing a fault indication based at least upon whether the first value is substantially consistent with the second value.

78. (Currently Amended) An optical switch facilitating the verification of optical path integrity, comprising a plurality of optical signal ports and at least one optical switching means for causing an optical signal incident along a first optical signal port to be transmissively coupled to a second optical signal port, the optical switch further comprising:

a first supplemental signal detecting means coupled to the first optical signal port for detecting a supplemental signal associated with the optical signal, wherein the supplemental signal includes a modulation applied to the optical signal;

a second supplemental signal detecting means coupled to the second signal port for detecting the supplemental signal associated with the optical signal,

~~The optical switch of claim 73~~ wherein the first supplemental detecting means determines a first amplitude value of the supplemental signal and the second supplemental detecting means determines a second amplitude value of the supplemental signal, ~~further comprising; and~~

a loss determining means which determines a loss value by calculating a difference between the first amplitude value and the second amplitude value.

79. (Original) The optical switch of claim 78 further comprising:

fault indicating means coupled to the loss determining means for issuing a fault indication based at least upon whether the loss value meets a criterion.

80. (Original) The optical switch of claim 79 wherein the criterion is based upon previous values of the loss value.

81. (Original) The optical switch of claim 79 further comprising communicating means for communicating with a source outside the optical switch to affect the criterion.

82. (Canceled)

83. (Canceled)

84. (Currently Amended) An optical switch facilitating the verification of optical path integrity, comprising a plurality of optical signal ports and at least one optical switching means

for causing an optical signal incident along a first optical signal port to be transmissively coupled to a second optical signal port, the optical switch further comprising:

a supplemental signal injecting means coupled to an optical line associated with the first optical signal port for adding a supplemental signal associated with the optical signal, wherein the supplemental signal includes a modulation applied to the optical signal;

a supplemental signal detecting means coupled to a second optical line associated with the second signal port for detecting the supplemental signal associated with the optical signal; comparing means for comparing the supplemental signal as injected by the supplemental signal injecting means to the supplemental signal as detected by the supplemental signal detecting means;

fault indicating means coupled to the comparing means for issuing a fault indication based at least upon whether the detected supplemental signal is substantially consistent with the injected supplemental signal; and

~~The optical switch of claim 82 further comprising:~~

~~means for determining the value of at least one attribute of the detected supplemental signal from the supplemental signal detecting means; and~~
, wherein the fault indicating means for issuing a is further enabled to issue the fault indication based at least upon whether the value of the attribute does not meet at least one criterion.

85. (Canceled)

86. (Currently Amended) An optical switch facilitating the verification of optical path integrity, comprising a plurality of optical signal ports and at least one optical switching means

for causing an optical signal incident along a first optical signal port to be transmissively coupled to a second optical signal port, the optical switch further comprising:

a supplemental signal injecting means coupled to an optical line associated with the first optical signal port for adding a supplemental signal associated with the optical signal, wherein the supplemental signal includes a modulation applied to the optical signal;

a supplemental signal detecting means coupled to a second optical line associated with the second signal port for detecting the supplemental signal associated with the optical signal; comparing means for comparing the supplemental signal as injected by the supplemental signal injecting means to the supplemental signal as detected by the supplemental signal detecting means; and

fault indicating means coupled to the comparing means for issuing a fault indication based at least upon whether the detected supplemental signal is substantially consistent with the injected supplemental signal,

~~The optical switch of claim 82 further comprising:~~

~~wherein the comparing means for comparing is further enabled to compare a first value of at least one attribute of the supplemental signal as injected by the supplemental signal injecting means to a second value of the attribute supplemental signal as detected by the supplemental signal detecting means; , and~~

~~wherein the fault indicating means coupled to the comparing means for issuing a is further enabled to issue the fault indication based at least upon whether the first value is substantially consistent with the second value.~~

87-97. (Canceled)

98. (Previously Presented) An optical switch facilitating the verification of optical path integrity, comprising a plurality of optical signal ports and at least one optical switching means for causing an optical signal incident along a first optical signal port to be transmissively coupled to a second optical signal port, wherein the optical signal has an associated first supplemental signal originating outside of the optical switch, the optical switch further comprising:

supplemental signal modifying means, coupled to a first optical line associated with the first optical signal port, for changing the first supplemental signal into a second supplemental signal associated with the optical signal; and

a supplemental signal detecting means coupled to the second signal port for detecting at least one supplemental signal associated with the optical signal,

wherein the optical switch infers at least one attribute of the first supplemental signal by detection of the second supplemental signal and issues a fault indication if the attribute does not meet an expected criterion for the first supplemental signal.

99. (Original) The optical switch of claim 98 further comprising communicating means for communicating with a source outside the optical switch to affect the criterion.

100. (Previously Presented) An optical switch facilitating the verification of optical path integrity, comprising a plurality of optical signal ports and at least one optical switching means for causing an optical signal incident along a first optical signal port to be transmissively coupled to a second optical signal port, wherein the optical signal has an associated first supplemental signal originating outside of the optical switch, the optical switch further comprising:

supplemental signal modifying means, coupled to a first optical line associated with the first optical signal port, for changing the first supplemental signal into a second supplemental signal associated with the optical signal; and

a supplemental signal detecting means coupled to the second signal port for detecting at least one supplemental signal associated with the optical signal,

wherein the optical switch infers at least one attribute of the first supplemental signal by detecting the second supplemental signal and issues a fault indication if either the first supplemental signal does not meet a first expected criterion or, inclusively, the second supplemental signal does not meet a second expected criterion.

101. (Original) The optical switch of claim 100 further comprising communicating means for communicating with a source outside the optical switch to affect at least one of the first and second criteria.

102. (Canceled)

103. (Canceled)

104. (Previously Presented) An optical switch facilitating the verification of optical path integrity, comprising a plurality of optical signal ports and at least one optical switching means for causing an optical signal incident along a first optical signal port to be transmissively coupled to a second optical signal port, wherein the optical signal has an associated first supplemental signal originating outside of the optical switch, the optical switch further comprising:

supplemental signal modifying means, coupled to a first optical line associated with the first optical signal port, for changing the first supplemental signal into a second supplemental signal associated with the optical signal; and

a supplemental signal detecting means coupled to the second signal port for detecting at least one supplemental signal associated with the optical signal,

wherein a first value for at least one attribute of the first supplemental signal is detected by the supplemental signal modifying means and a second value for the attribute of the first supplemental signal is also inferred from the second supplemental signal received by the supplemental signal detector and the optical switch issues a fault indication based upon whether the first value agrees with the second value.